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ABSTRACT

Using a panel of 50 experts in media and/or teaching, this study identified 69 educational technology competencies perceived to be related to teaching effectiveness. The questionnaire developed from the initial investigation (the Inventory of Teacher Competencies Related to Educational Media) was used with representatives from 26 institutions of higher education in Alabama with state-approved teacher education programs to assess their perceptions of teacher competencies related to educational media at the preservice level, and the degree to which the competencies were being taught in teacher education programs in Alabama. Results indicated that media specialists, teacher educators, administrators, and teachers perceive educational technology competencies for teachers as highly important, but that preservice preparation program graduates have not utilized educational technology at the importance levels established by the experts' and institutional representatives' perceptions. Most competencies were perceived as "very important" by the representatives. The only two competencies rated as less than "moderately important" concerned the use and operation of microcomputers. No single competency was taught in more than 57.1 percent of the institutions. This report includes data tables, 23 references, and an appendix with the ranked teacher competencies. (LMM)

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EDUCATIONAL TECHNOLOGY AND TEACHER COMPETENCE:

IDENTIFICATION AND PRESERVICE ASSESSMENT

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Introduction

Indications of a persistent lack of confidence in American education are reflected by the publication each year of the results of the "Gallup Poll of the Public's Attitudes Toward the Public Schools." A review of the reports in issues of Phi Delta Kappan from 1974-1980 revealed a steady decline in the ratings ("12th Annual Gallup," 1980). The search for an explanation for the espoused weaknesses in the schools has focused substantial attention on the effectiveness of classroom teachers and their professional preparation.

Considerable research has identified skills, competencies, and characteristics that correlate positively with effective teaching (e.g. Medley, 1973; Rosenshine, 1976; Ryans, 1960). One of the competencies consistently identified by the intense exploration by researchers and practitioners is the teacher's ability to design instruction utilizing educational technology ("A Framework," 1978; Schmitthausler, 1975). Moldstad (1974) summarized the findings:

1. Significantly greater learning often results when media are integrated into the traditional instructional program.
2. Equal amounts of learning are often accomplished in significantly less time using instructional technology.
3. Multimedia instructional programs based upon a "systems approach" frequently facilitate student learning more effectively than traditional instruction.

4. Multimedia and/or audiotutorial instructional programs are usually preferred by students when compared with traditional instruction. (p. 390)

However, the extensive benefits to be derived from instructional media can be attained only by teachers who are competent in their use. Wilkinson (1980) emphasized that "Media are more effectively and efficiently used, and therefore have greater impact on students, when teachers have received specific training in their utilization" (p.39).

The role of educational media competencies as a component of teacher preparation programs has been significantly impacted by three factors. One, the education profession has been subjected to critical scrutiny by members of its own ranks as well as the public sector as emphasis on accountability and cost effectiveness has increased. Two, a rapid proliferation of technology has created an increasing array of tools and techniques of communication, entertainment, and instruction. Teachers must cope with students who are "media literates." Three, there have been myriad research studies conducted on the effectiveness of educational technology in the teaching/learning process.

The role of educational media in classroom instruction with implications for teacher preparation has been a focal point of the increased attention to quality of programs. In a comprehensive assessment of the status and trends of teacher preparation sponsored by the National Center for Education Statistics in 1975, the contribution of instructional technology was one of five central questions investigated (Steele, 1977).

The media collections of many public schools have become quite extensive due to materials and equipment purchased with the influx of federal funds allocated by the Elementary and Secondary Education Act of 1965. The amount of money spent by public schools for audiovisual supplies, equipment, and salaries in 1966 was $187,047,000 (Lawrence, 1969). Title III's support for innovative and exemplary programs released funds for purchase without always demanding appropriate justification and evaluation. A frequent result was that the materials and equipment remained idle because teachers had not been prepared adequately to utilize them.

Teacher education programs must make provisions for preservice teachers not only to have available a variety of the latest equipment and materials, but also to have experiences in which they are called upon to make decisions as to the best materials, equipment, and learning arrangements for bringing about desired responses by the learner. Teachers must learn how to select, produce, and utilize a wide variety of materials; how to employ a variety of techniques and approaches; and how to evaluate the results of their efforts. They must learn how to make instructional decisions based on consideration of the varied factors impinging upon the instructional situation (Byrd, 1978; Rogers, 1978a). To increase the probability that teachers achieve competence in these generic skills, they must become a component of teacher education programs.

The primary accrediting agency of teacher education programs in the nation, the National Council for the Accreditation of Teacher Education, has adhered to the previously documented

principles of media research. Standard 2.3.3 Curricula for Basic Programs, Teaching and Learning Theory with Laboratory and Clinical Experience, stated:

> There is a body of knowledge about teaching and learning that should be the basis for effective performance. Certain kinds of problems (such as planning, selection of learning resources . . .) represent recurring types of classroom situations. (p. 6)

And specific reference was made in Standard 5.2, Materials and Instructional Media Center:

> Modern media and materials are essential elements in the communications system of contemporary society. For this reason, teachers need to understand the technologies that make such media and materials usable in their teaching and need to possess skills in using them . . . . A program for the preparation of teachers includes the use of teaching-learning materials and instructional media (so that) . . . prospective teachers are instructed in how to devise and use modern technologies in their teaching. ("Standards for Accreditation," 1981, p. 10)

Allen and Mackin (1973) asserted that teacher education should be the first to respond to the test "the impact that advanced technology" (p. 3) will have on the staffing and curriculum of the schools. However, in a nationwide survey of 916 accredited institutions which offered elementary education curricula, only 40% required preservice teachers to complete an educational media course (Roeder, 1973).

It seems that the extent to which preservice programs provide for the development of media competencies of teachers is a fundamental concern; but, differences in perception of the field tended to cause its application in "bits and pieces" rather than as a process. Nelson (1976) exemplified this problem in the study of educational media for teachers in Oregon. He concluded: "While all newly certified teachers will have 'preparation in educational media,' their competencies will vary widely" (abstract).

It is logical to expect that teachers who have not had formal preparation will not possess the competencies that are needed to utilize multimedia approaches to teaching. According to research by Camp (1957), Streeter (1969), and Branscombe (1969), there was a positive correlation between teachers' competencies and their frequency of educational media utilization. A study by Rogers (1978a) of factors affecting teachers' utilization concurred, and yielded further evidence that the strongest relationships were between attitude and use.

Everson et al. (1979) also investigated attitudes toward media and supported the hypothesis that fear of automation was an important variable modifying teachers' attitudes. Their findings determined that not only did attitudes influence utilization of media but they could have interfered with student achievement from the materials. However, data seemed to suggest that teachers' fears could be attenuated by exposure to and familiarity with educational application of media. In a similar vein, Romano and Spiecker (1974) found that exposure to audiovisual experiences in courses had an impact on frequency of utilization. According to Branscombe (1969), exposure at the preservice level was critical

because utilization patterns formed there were comparatively difficult to alter later.

While the incorporation of educational technology and student achievement are positively correlated, studies have reported a large population of teachers who do not consistently utilize educational technology. The research indicates that these teachers have not been prepared in this areaat the preservice level. Preliminary research revealed that the actual practice of providing educational technology competencies for teachers in preservice programs was inadequate due to two factors:

> (a) lack of an identifiable set of specific competencies correlated with teacher effectiveness; (b) lack of current measures to assess the status of teacher preparation in educational technology.

This inadequacy merits further investigation.

Statement of the Problem

This study was designed to identify the most important teacher competencies related to educational technology in the preparation of teachers at the preservice level. In addition, the study assessed the curricular provision for the identified competencies in a selected sample of teacher education programs. The need in Alabama for specification of the competencies for teachers was illuminated when the Standards for Teacher Education and Certification included media as a requirement in the preservice preparation programs without identifying the competencies. The problem was further complicated by the lack of a measure which

indicated the nature and extent of the competencies being taught in each of the programs.

The following research questions were investigated in the study:

1. What educational technology competencies for teachers are identified as most important by experts in the fields of media and teaching?
2. What educational technology competencies for teachers are identified as most important by personnel in a selected sample of teacher education programs?
3. What is the relationship between the competencies identified by the experts and the competencies identified by the personnel in the teacher education programs?
4. To what extent are the identified competencies taught in selected sample of teacher education programs?
5. What is the relationship between the competencies identified by the experts and the extent to which the competencies are taught in the selected sample of teacher education programs?

Methodology

The study was composed of two sequential phases: identification and assessment. A two-round modified Delphi Technique was utilized in the identification phase. The data from the Delphi were used as the basis for the assessment phase.

Identification

The modified Delphi panel. Fifty experts in the fields of media and/or teaching were selected as members of the modified

Delphi panel. Twenty media specialists from throughout the United States, and 10 teacher educators, 10 supervisors/administrators, and 10 classroom teachers, from Alabama, comprised the four sub-groups. Group membership was determined by the experts' publications, research, or practical applications in technology and/or teacher effectiveness. The fifty members were randomly selected from a group of 100 who were initially identified according to the criteria.

Instrumentation.

The instrument, entitled Inventory of Teacher Competencies Related to Educational Media, was a questionnaire designed to be completed by the identified Delphi panel members. It consisted of four parts: (a) personal and professional background of the respondent, (b) structured items to measure the respondent's perception of the importance of media competencies in the preservice preparation program, (c) an opportunity for formulation of additional competencies, and (d) an opportunity for other comments.

The first round of the instrument was formulated by the researcher from a review of research on educational technology and teacher effectiveness. It was determined from the review that no valid instrument existed to measure the desired competencies. The available instruments were of limited usefulness due to a lack of relevant content, inadequate measurement techniques, and/or an orientation to traditional materials. As stated by Rogers (1968b) in a comprehensive review, "Although much is written about competencies needed by teachers in working with media . . . resources, little research has dealt with the measurement of these competencies" (p. 18).

Areas of competence were identified, and some degree of consensus based on their recurring appearance was sought. Striving for uniformity of statement, the researcher translated the areas into 54 specific competencies in seven randomly ordered categories:

1. Visual/Aural/Computer Literacies - 3 items
2. Production Techniques - 13 items
3. Equipment Operation - 10 items
4. Selection and Utilization Principles - 17 items
5. Communication Principles/Mass Media - 4 items
6. Systems Approach/Instructional Design - 4 items
7. Evaluation of Media, Instruction - 3 items

To determine the degree to which respondents felt each competency was important in the preservice preparation of teachers, they were asked to respond on a 4-point Likert-type scale with the following options:

1 = little or no importance

2 = somewhat important

3 = moderately important

4 = very important

The instrument was subjected to field test for clarity by a doctoral level class composed of classroom teachers and for content review by two media specialists.

The primary purposes of the second round were to provide each expert: (a) with feedback from Round One regarding the consensus on each item; (b) an opportunity to re-rate any item, if desired, and (c) an opportunity to justify the rating if it deviated from the mean. The instrument indicated the frequencies for each

response rating and the mean for each item. On the Round II instruments mailed to the respondents, individual responses from Round One were indicated in red. Since all of the 54 Round I competencies received a rating of "moderately important" or "very important" by 60% or more of the respondents, each competency was retained for Round Two. The respondents generated a total of 15 additional competences which were placed within categories deemed appropriate by the researcher. Response to each of these items was requested according to the original scale.

The nature of the study dictated the use of a mailing system to obtain the responses to each set of instruments.

Assessment

Institutional representatives. The twenty-six institutions of higher education in Alabama with state approved teacher education programs formed the selected sample. A representative of each institution was designated by the respective dean. The criterion for designation was specified as the person directly responsible for teaching or supervising the course (or other approach) which provided for the greatest number of media competencies for preservice teachers.

Instrumentation. The instrument for the institutional assessment was designed to assess (a) the institutional representatives' perceptions of the importance of teacher competencies related to educational media at the preservice level, and (b) the degree to which the competencies were taught in the teacher education programs in Alabama.

This instrument was formulated on the basis of the analysis of the results of Round Two. Each of the 69 competencies received a rating of "moderately important" or "very important" by 60% or more of the respondents; therefore, each competency was retained. The instrument consisted of three parts: (a) the 69 competency statements to measure the respondent's perception of the importance of their inclusion in the preservice program, and the extent to which each competency was included in the institution's program: (b) a request for a narrative description of the basic undergraduate preparation in educational media typical of future teachers who graduated from the institution; and (c) an opportunity to express other relevant comments.

In the first part, the response scale for perceptions was identical to the Round One instrument. The extent to which the competency was taught in the institution was measured according to the following scale:

1 = introductory awareness level in a required course/experience

2 = indepth knowledge acquisition level in a required course/experience

3 = demonstrated performance level in a required course/experience

4 = introductory awareness level in an elective course/experience

5 = indepth knowledge acquisition level in an elective course/experience

6 = demonstrated performance level in an elective course/experience

7 = not addressed in our preparation program

The decision to use the three levels of (a) introductory awareness, (b) indepth knowledge, and (c) demonstrated performance was based on findings from the literature concerning the formulation of foundations for effective teaching. The California State Department of Education project on teacher education programs specified the developmental process from knowledge to understanding to application ("A Framework," 1978; Schalock, 1970).

Data Analysis

The rank orders of identified competencies and the seven categories were calculated utilizing the item means and the item means within categories. Relationships were measured by the Kendall tau and Spearman rho rank order correlation coefficients, with the .05 level designated as the criterion for significance. The significance of the differences was determined by the utilization of the chi square statistic.

Results

Frequencies, percentages, and means were computed for each item and each of the seven categories to provide the data to answer systematically the five research questions.

Perceptions of Modified Delphi Panel

Analysis of these data revealed that importance ratings were very high. At the conclusion of Round Two, 64 of the 69 competencies had means of 3.00 or above, in the "moderately

important" or "very important" range. Of these 64, 36 were ranked at 3.50 or above, "very important." Therefore, of the competencies identified in the literature by the researcher, over 1/2 (52%) were considered by the modified Delphi panel to be "very important" for preservice teachers. The 69 competency statements in rank order are presented in the Appendix.

Perceptions of Teacher Education Personnel

The perceptions of importance by personnel in the teacher education programs in Alabama were calculated from the responses by the Institutional Representatives. The analyses included establishing the rank order of the items and the rank order of the categories of items. According to examination of these data, importance ratings were very high. Of the 69 competencies, 67 had means of 3.00 or above in the "moderately important" or "very important" range. Fifty-two of the items had mean ratings of 3.50 or above, which classified them as "very important." Therefore 3/4 (75%) of the competencies were perceived as "very important" for preservice teachers by representatives of Alabama's teacher education programs, and an additional 22% were considered to be "moderately important."

Delphi/Teacher Education Relationship

Determination of the relationship between the perceptions of the two groups was made by the use of three statistical analyses. Correlation coefficients were computed on the rankings of the two groups by item and by category. The chi square compared the number of responses classified in each category of the importance scale by group.

The rank orders of the competencies for the experts and for the teacher education personnel were derived from the mean ratings for each item. The Kendall's tau correlation coefficient computed on the rankings indicated a significant positive correlation between the ranks of the two groups (tau = .5665, p = .001).

The relationship between groups and perceptions of importance was tested for each item by the chi square statistic by comparing the number of responses classified in each category of the importance scale by group. The results showed a significant discrepancy between groups on only four of the 69 items: use of microcomputers, production of lettering and duplicating paste-ups, and use of behavioral models. The teacher education program ratings were higher in every case.

The third analysis of the relationship between the two groups was computed by comparing the rankings by categories of competencies. The rankings were derived by calculating the means of the set of items within each category. The rankings by the experts and by the institutional representatives are found in Table 1. For consistency throughout the study, the ranks of the panel of experts were used as the established rank order.

Table 1

Rank of Categories by Importance for Experts and for Institutional Representatives

Categories	Ranks	
	Experts ($\bar{X}$)	Institutions ($\bar{X}$)
C--Equipment Operation	1 (3.65)	2 (3.70)
D--Selection and Utilization Principles	2 (3.59)	3 (3.68)
E--Communication Principles/ Mass Media	3 (3.49)	4 (3.63)
F--Systems Approach/ Instructional Design	4 (3.39)	1 (3.73)
G--Evaluation of Media, Instruction	5 (3.28)	6 (3.42)
B--Production Techniques	6 (3.27)	5 (3.55)
A--Visual/Aural/Computer Literacies	7 (3.19)	7 (3.33)

The Spearman's rho correlation coefficient computed on the rankings indicated a somewhat positive significant correlation ($P = .750$, $p = .05$, critical value = .714).

The results of these three statistical analyses revealed a consistent, positive relationship between perceptions of the experts and the institutional representatives.

Competencies: Extent Taught

The identified competencies were taught in the selected sample of teacher education programs on a range from 0.0% to 57.1% of the programs. Two items were taught in 57.1% of the programs: one concerned educational goals and learning objectives, and the other related to the elements of a lesson on the basis of a model. Designing teaching/learning strategies for microcomputers and developing an understanding in the telecommunications area were not addressed in 61.9% of the programs.

The rank order of categories according to extent to which taught was determined by averaging the percentages of responses at level 3, demonstrated performance level in a required course. The rank order of the extent to which each category was taught is reported in Table 2.

Table 2

Rank Order of Extent to Which Each Category Is Taught Derived from Percentages of Responses at Level 3

Category	Rank	Average %
C--Equipment Operation	1	44.6
F--Systems Approach/Instructional Design	2	39.9
B--Production Techniques	3	37.8
D--Selection and Utilization Principles	4	29.6
E--Communication Principles/ Mass Media	5	26.2
G--Evaluation of Media, Instruction	6	21.1
A--Visual/Aural/Computer Literacies	7	19.1

Analysis revealed that the range of responses for the extent to which the categories were taught was limited--25 percentage points. In addition, all the percentages were below 50%. The category ranked first was taught in an average of only 44.6% of institutions.

Delphi/Extent Taught Relationship

The relationship between the variable of expert perceptions and the variable of extent to which the competencies are taught was analyzed by comparing the rankings by categories of competencies. The rank orders were calculated by computing the means for the sets

of items within each category. The rankings of the two variable groups appear in Table 3.

Table 3

Rank Order of Categories by Importance According to Experts' Perceptions and Extent Taught in Programs

Category	Ranks	
	Experts	Extent taught
C--Equipment Operation	1	1
D--Selection and Utilization Principles	2	4
E--Communication Principles/Mass Media	3	5
F--Systems Approach/Instructional Design	4	2
G--Evaluation of Media, Instruction	5	6
B--Production Techniques	6	3
A--Visual/Aural/Computer Literacies	7	7

There was not a significant positive correlation between the rankings according to the results of the Spearman's rho correlation coefficient (P = .6071, not significant - critical value = .714).

Conclusions and Discussion

Based on the findings in this study, two conclusions were drawn: (a) media specialists, teacher educators, administrators, and teachers perceive educational technology competencies for teachers as highly important; and (b) graduates of the preservice preparation programs in Alabama have not utilized educational technology at the levels of importance established by the experts' and institutional representatives' perceptions.

On a range from 1.0-4.0, 64 of the 69 competencies on Round II had means of 3.00 or above, in the "moderately important" or "very important" range. The five competencies whose means were below 3.00 related to the use of microcomputers, developments in the telecommunications/computer area, and production of color lift transparencies, black and white photographs, and paper color prints.

Seventy-five percent of the identified competencies process were perceived as "very important" for preservice teachers by representatives of Alabama's teacher education programs. The only two competencies rated as less than "moderately important" related to the use and operation of microcomputers.

Provision for preservice preparation has not been at a level consistent with the perceptions. No category was taught in more than 44.6% of the institutions, and no single competency was taught in more than 57.1% of the institutions.

Therefore, it may be concluded that utilization levels are lower than perception levels. Based on the findings in the

literature, there is a predictive value of preparation associated with utilization (Branscombe, 1969; Romano & Spiecker, 1974). In addition, a strong relationship was reported between preparation and attitude, and attitude and use (Rogers, 1978a). Everson et al. (1979) found that not only do attitudes influence utilization of media, but they may interfere with student achievement from the materials. They cited data which suggested that teachers' fears could be attenuated by exposure to and familiarity with the educational application of media.

In summary, this study identified 69 educational technology competencies that are perceived to be related to teaching effectiveness. An assessment of a selected sample of teacher education programs revealed that a significant percentage of these competencies are not included in the programs. This disparity offers a challenge to personnel in teacher education programs who seek to improve teacher effectiveness.

APPENDIX

Ranked Competencies Derived from Round II Means

Competency	Rank	Mean
21. Set up, operate, and take down manual and automatic 16mm projectors	1	3.93
25. Set up, operate, and take down silent and sound filmstrip projectors	2	3.90
27. Set up, operate, and take down a cassette tape recorder	3	3.86
26. Set up, operate, and take down a record player	4.5	3.83
22. Set up, operate, and take down an overhead projector	4.5	3.83
24. Set up, operate, and taken down a slide projector	6	3.81
47. Evaluate the suitability of specific media on the basis of interests, experience, maturity, and powers of comprehension of a given group of learners	7	3.79
41. Describe the major characteristics, advantages and disadvantages, and appropriate teaching/learning situation for motion pictures	9	3.76
55. Formulate educational goals and write learning objectives which specify outcomes, achievements, and evaluations for students	10.5	3.74
38. Describe the major characteristics, advantages and disadvantages, and appropriate teaching/learning situations for graphics (charts, graphs, diagrams, etc.)	10.5	3.74

Competency	Rank	Mean
50. Describe the role of a school media specialist in providing services for classroom teachers	10.5	3.74
16. Produce materials for display (bulletin boards, cloth boards, or other visual displays)	10.5	3.74
54. Formulate objectives and strategies for utilizing mass media in teaching/learning situations	14	3.71
40. Describe the major characteristics, advantages and disadvantages, and appropriate teaching/learning situations for educational television	14	3.71
42. Describe the major characteristics, advantages and disadvantages, and appropriate teaching/learning situations for disc recordings/tape recordings	14	3.71
37. Describe the major characteristics, advantages and disadvantages, and appropriate teaching/learning situations for physical objects and models	17	3.69
39. Describe the major characteristics, advantages and disadvantages, and appropriate teaching/learning situations for games and simulations	17	3.69
44. Describe the major characteristics, advantages and disadvantages, and appropriate teaching/learning situations for print (texts)	17	3.69
30. Perform simple maintenance operations on equipment (such as replacing bulbs)	19	3.68

Competency	Rank	Mean
17. Produce graphics (chart, graph, diagram) appropriate to a specified learning objective and with evidence of technical quality	20.5	3.67
63. Assess media utilization procedures in terms of student growth and achievement according to specified instructional objectives	20.5	3.67
14. Produce audio recording (cassette or reel-to-reel) appropriate to a specified learning objective and with evidence of technical quality	23	3.64
43. Describe the major characteristics, advantages and disadvantages, and appropriate teaching/learning situations for projected and nonprojected still pictures	23	3.64
49. Explain rights, limitations and responsibilities of users of copyrighted material as outlined in the Copyright Law	23	3.64
1. Define and develop strategies for utilizing visual literacy skills for a specified group of learners	26	3.62
56. Name and define the three domains of learning (cognitive, affective, psychomotor)	26	3.62
57. Write learning objectives illustrating each of the three domains of learning	26	3.62

Competency	Rank	Mean
58. Construct the elements of a lesson on the basis of a model which represents a systematic approach to teaching and learning	29	3.60
35. Describe the major characteristics, advantages and disadvantages, and appropriate teaching/learning situations for programmed instruction	29	3.60
34. Verify the appropriateness of educational media for a specified teaching/learning situation by analyzing the level of sophistication, the cost, the availability and the technical quality	29	3.60
10. Produce a handmade transparency appropriate to a specified learning objective and with evidence of technical quality	31	3.57
29. Set up, operate, and take down a video recorder	32	3.55
32. Identify sources of educational media materials through the use of selection aids such as Booklist, NICEM indices, etc.	33.5	3.52
23. Set up, operate, and take down an opaque projector	33.5	3.52
5. Identify and demonstrate the elements of composition in the preparation of visuals	35.5	3.50
2. Define and develop strategies for utilizing aural literacy skills for a specified group of learners	35.5	3.50

Competency	Rank	Mean
45. Describe the major characteristics, advantages and disadvantages, and appropriate teaching/learning situations for chalkboards	37.5	3.44
46. Describe the major characteristics, advantages and disadvantages, and appropriate teaching/learning situations for video recordings	37.5	3.44
7. Produce a laminated visual appropriate to a specified learning objective and with evidence of technical quality	39	3.43
20. Direct and assist students in preparation of their own media	40	3.41
53. Analyze the techniques, processes, and impact of the mass media (TV, radio, newspapers, etc.) on schools and students	42	3.40
52. Identify, analyze, and utilize nonverbal forms of communication	42	3.40
33. Describe the elements and procedures of a basic utilization plan (such as select, preview, use, followup, and evaluate) for educational media	42	3.40
51. Define components of the communication process and identify factors which enhance accurate transmission of messages	44.5	3.38
15. Produce a video recording (with camera and off-air) appropriate to a specified learning objective and with evidence of technical quality	44.5	3.38

Competency	Rank	Mean
65. Employ validation procedures for commercially prepared materials	46	3.34
64. Devise and employ validation procedures for teacher-made materials	47.5	3.33
62. Devise media presentations to accompany commercial learning programs, i.e., textbooks	47.5	3.33
68. Design, construct, and validate a self-instructional module in kit form	49	3.31
13. Produce 2x2, 35mm slides appropriate to a specified learning objective and with evidence of technical quality	50	3.29
6. Produce a dry mounted visual appropriate to a specified learning objective and with evidence of technical quality	51.5	3.26
48. Display a knowledge base of educational media concepts by distinguishing among terms such as educational technology, instructional resources, software, hardware, and cost effective	51.5	3.26
36. Describe the major characteristics, advantages and disadvantages, and appropriate teaching/learning situations for computer assisted instruction	53	3.24
61. Determine the impact of media on learners from a psychological perspective	54	3.18
28. Set up, operate, and take down a reel-to-reel tape recorder	55	3.17

Competency	Rank	Mean
69. Interpret the adequacy of research findings in the media area	56	3.16
66. Design and produce a set of visualized test items	57	3.15
12. Produce a heat process transparency appropriate to a specified learning objective and with evidence of technical quality	58	3.14
9. Produce a paste-up suitable for duplication appropriate to a specified learning objectiive and with evidence of technical quality	59	3.10
60. Assess the complexity of introducing educational change into the system	60	3.03
8. Produce three types of lettering appropriate to a specified learning objective and with evidence of technical quality	61.5	3.02
31. Operate microcomputer to utilize commercially prepared software	61.5	3.02
59. Develop the ability to explain and use behavioral models	63.5	3.00
67. Design and produce an audio test	63.5	3.00
4. Develop an understanding of current and expected developments in the telecommunications/ computer area	65	2.89
11. Produce a color lift transparency appropriate to a specified learning objective and with evidence of technical quality	66	2.79

Competency	Rank	Mean
3. Design teaching/learning strategies incorporating the use of microcomputers for a specified group of learners	67	2.74
18. Produce black and white photographs appropriate to a specified learning objective and with evidence of technical quality	68	2.72
19. Produce paper color prints appropriate to a specified learning objective and with evidence of technical quality	69	2.69

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